ANTI-A AND ANTI-B ANTIBODIES HIGH TITER IN GROUP 'O' BLOOD DONORS - A TERTIARY CARE HOSPITAL BLOOD BANK EXPERIENCE

Anum Sharif*, Mansoor Ishaq Raja, Waqas Hanif*, Muhammad Sajid Yazdani***, Hamid Iqbal*, Noreen Anwar***

*Combined Military Hospital (National University of Medical Sciences), Multan, Pakistan
**Armed Forces Institute of Transfusion (National University of Medical Sciences), Rawalpindi, Pakistan
***Combined Military Hospital, Abbottabad, Pakistan

ABSTRACT

Objectives; To determine the frequency of titre anti-A and anti-B antibodies in donors with blood group O.
Material and Methods: The study was conducted at Combined Military Hospital Multan from October 2019 to April 2020. This cross-sectional study has conducted after the approval of ethics review committee; A total of 300 individuals with blood group O reported for blood donation during the study period were considered in this study. After their consent, 10 ml whole blood of each donor was collected in two tubes, 3 ml collected in Ethylenediaminetetraacetic acid (EDTA) tube and 7 ml in plain tube. Anti-A & anti-B antibodies titers were performed using pooled blood group A and B red cells by tube method at room temperature and 37° C.
Results: Male consisted of 174 (58%) and female consisted of 126 (42%) with male to female ratio of 1.5:1 out of 300 blood donors. The ages of individuals range from 20 to 50 years (32.8 ± 7.2). The frequencies of titer of anti-A antibodies and anti-B antibodies were found to be 17.7% and 9.0% respectively.
Conclusion: Titer of anti-A antibodies is high in considerable number of blood group O donors supports cautious use of Blood group O products in non-O recipients without screening. However, frequency of titer of anti-B antibodies was found to be relatively low.
Key Words: Anti-B, Anti-A, High titre, Blood group O, Non-O Blood group.

This article can be cited as: Sharif A, Raja MI, Hanif W, Yazdani MS, Iqbal H, Anwar N. High titre anti-A & anti-B antibodies in group 'O' blood donors - A tertiary care hospital blood bank experience. 2022; 33(1): 25-28.

DOI: 10.55629/pakjpathol.v33i1.700.

INTRODUCTION

ABO blood group classification system was revealed by Karl Landsteiner and had been credited in 1900 [1]. The destruction of incompatible cells in recipients due to corresponding antibodies present in donor blood is very important in clinical blood transfusion practice which shows the significance of a blood group system [2]. The most fatal transfusion reaction among all transfusion reactions is ABO incompatibility leading to hemolysis due to complement-mediated intravascular hemolysis. After age of 6 months human body start developing anti A antibodies and anti B antibodies in his serum if corresponding antigens on red cells are absent. That is the reason, correct blood typing and cross matching are of utmost importance before transfusion to prevent transfusion reactions [3]. ABO typing consists of two process, first, testing red blood cells for A and B antigens (forward/cell/direct cell typing) and the serum for the A and B antibodies (reverse/serum/indirect typing) before transfusion. 11% of population of Pakistan is Rh D-negative, due to this Rh typing is also placed in venue of routine typing [4].

Group 'O' is called inappropriately "Universal blood donor" because blood group O red cells can be transfused to group O and non O groups like A, B, or AB recipients. But previous studies had been described the presence of potentially destructive, lytic anti-A antibodies and anti-B antibodies in individuals of group 'O' serum [5]. These corresponding antibodies have low complement activating ability. Because of this ability, large quantity of anti A antibodies and anti B antibodies are required as compared to naturally occurring corresponding antibodies, for intravascular hemolysis known as hemolytic transfusion reaction (HTR) [6,7]. Intravascular hemolysis due to hemagglutinins and hemolysin can be prevented by restriction of the volume of transfused ABO-incompatible plasma and component therapy, which is now routinely clinically practiced in most of the healthcare setups especially at tertiary care hospitals in our country is an example of restriction of volume [8], Presence of anti-A antibodies and/or anti-B antibodies in donors exposes the non O blood group recipients at higher risk of hemolysis [9,10].

We performed this study to determine the frequency of high titre anti-A and anti-B antibodies in blood group O blood donors and thus the assessment of risk to non-O group recipients.

MATERIAL AND METHODS

This cross-sectional study was carried out at Haematology Department and blood bank, Combined

Correspondence: Dr Waqas Hanif, Consultant Pathologist, Combined Military Hospital, Multan, Pakistan.

Email: **drwaqas10@yahoo.com**

*Received: **03 Feb 2022**; Revised: **9 Mar 2022**; Accepted: **18 Mar 2022***

Military Hospital (CMH) Multan from October 2019 to April 2020. After the approval by Ethics review committee of the hospital the study was started. The sample size was calculated by WHO sample size calculator. Sample technique of non probability convenience technique was used for sampling. The blood grouping and cross match of all donors, reported at blood bank fulfilling the blood donor criteria, were performed as routine. 300 blood donors of all genders of group O were included in our study. After the informed consent, 10 ml of blood sample was drawn from each donor and collected in EDTA (3 ml) and plain tube (7 ml) for further processing. Forward and reverse blood grouping by tube method was performed to confirm the blood groups of all donors. The titration for anti-A antibodies & anti-B antibodies were carried out using pooled blood group A and B red cells by tube method at 25^{o}C and 37°C. The tube with maximum dilution showing agglutination by naked eye was taken as titre of respective antibody. The titre of 1:128 or higher was considered as high titre. The data was analysed by using SPSS version 20. In results quantitative variables was represented by mean and standard while qualitative variables by frequency and percentage. P-value of ≤ 0.05 was considered statistically significant.

RESULTS

174 (58%) out of 300 donors were male and 126 (42%) out of 300 donors were female with male to female ratio of 1.5:1. The age of blood donors ranges from 20 to 50 years with mean of 32.8±7.2 years. The majority of donors (180, 60.0%) were between 20 to 35 years (Table-I). In our study, frequency of titer of anti-B antibodies and anti-A antibodies was found to be 17.7% (53) and 9.0% (27) respectively.

Distribution of anti A antibodies and anti B antibodies titer according to age and according to previous history of transfusion shown in Table-I and Table-II respectively. Frequency of anti B antibodies and antibodies A titre in group O donors is shown in Table-III and stratification of anti A antibodies and anti B antibodies titre with respect to gender is shown in Table-IV.

Table-I: Distribution of donor's anti A antibodies and anti B antibodies titer according to Age (n=300).

Age (years)	No. of Patients with %age	High anti A antibodies titer		p-value	High anti B antibodies titer		p-value
		Yes	No		Yes	No	
20-35	180(60)	23	157	0.007	19	161	0.249
36-50	120(40)	30	90		08	112	

Mean ± SD = 32.78 ± 7.20 years

Table-II: Distribution of donor's anti A and anti B antibodies titer according to previous history of transfusion (n=300).

Previous history of blood transfusion	No. of Patients with %age	High anti A antibodies titre		p-value	High anti B antibodies titre		p-value
		Yes	No		Yes	No	
Yes	80(26.7)	21	59	.0001	05	75	0.316
No	220(73.3)	32	188		22	198	

Table-III: Frequency of anti B antibodies and antibodies A titre in group O donors (n=300).

Anti A antibody titre	No. of Patients with %age	Anti B antibody titre	No. of Patients with %age
Yes	53(17.7)	**Yes**	27(9)
No	247(82.3)	**No**	273(91)

Table-IV: Stratification of anti A antibodies and antibodies B titre with respect to gender.

Gender	High anti A antibodies titre		p-value	High anti B antibodies titre		p-value
	Yes	No		Yes	No	
Male	27	147	**0.251**	21	153	**0.029**
Female	26	100		06	120	

DISCUSSION

At this time, from discovery of the ABO blood group system, most of techniques we are using currently in clinical blood or blood components practice are centered on the principle of interactions between antigens and antibodies. Tests we are using that recognize the antibodies involved in hemolysis indicated the probably specificity of the antibodies in plasma of donors to corresponding antigens on red blood cells of the recipients, whether these antibodies

would have destroyed red blood cells bearing the corresponding antigens depend on various factors. Thus, actual cardinals of incompatibility grasp more than cross matching [11]. History starts from World War ll, when transfusion of the O group red cell (whole blood) to all including O group and non O groups had been started and continued, nevertheless severe hemolytic reactions due to the transfusion of group O to non-O group recipients. Transfusion hemolytic reaction has also been commonly reported after transfusion of single donor platelet concentrates of group O to non O groups. [12].

In our study, frequency of titer of anti-A antibodies and anti-B antibodies had been found to be 53 (17.7%) and 27 (9.0%) respectively. In a study at Lagos, presence of titer of anti-A antibodies and anti-B antibodies had been found to be 15.4% and 5.1% respectively whereas titer of anti-A antibodies and anti-B antibodies were found to be 9.7% donor samples [13].

The cumulative frequency titer of anti-A antibodies and/or anti-B antibodies obtained in this study was found to be 26.7%. This frequency is comparable with those found in a study conducted by Kulkarni *et al* [14] with frequency of 32.3% in Zaria in 1985 but slightly lower than that in another study conducted by Onwukeme and Nanna that had described a frequency of 38.1% in Jos in 1990. However, the findings of this study had been found to be lesser than a research study conducted by Worlledge *et al* [15] in which frequency was found to be 85%. David-West [16] who had been described a frequency of 56% and Okafor and Enebe [17] who had described a frequency of 53.6% for anti-A antibodies and 62.7% for anti-B antibodies. The result of our study was found to be higher than those described by Olawumi and Olatunji [18], which showed a frequency of 23.2% in Ilorin in 2001.

In our study prevalence of Anti-A antibodies or hemolysins were found to have higher prevalence (17.7%) than anti-B antibodies or hemolysins (9.0%). These results have been found to be in contrast with the findings of Olawumi and Olatunji and Okafor and Enebe [17] who had reported that titer of anti-B antibodies at a higher frequency than titer of anti-A antibodies. However, they had also concluded that the high titre antibodies between these two were anti-A antibodies with greater hemolytic potential. Josephson *et al* [19] however, confirmed in his study the prevalence of the "high-titer" anti-A antibodies in group O donors which are findings of our study.

There are multiple factors which are involved to surge titer of anti A antibodies and anti B antibodies among donors. Similarly, prevalence of a high antibodies titer in populations of Asian and Black has been recognized by amplified frequencies of mosquito bites infections and intestinal parasitic infestations. Other factors among group O individuals, titers of anti A antibodies and anti B antibodies can be found high due to inoculation and other antigen disclosures such as pregnancy, and transfusions. Ethnic or racial contextual of the donors also play crucial role and other contributing factors like environmental factors [20].

There are multiple factors which determine the detection of antigen antibody reaction of ABO blood group between donor and recipients in vitro. These factors are agglutination [23] testing method used at different centres, the use of recipient and/or donor red cells for pooling and use of monoclonal vs polyclonal antibodies. These factors are required to be studied further in detail. Further studies are also suggested to correlate the clinical implications of these findings at a larger scale study.

CONCLUSION

The titer of anti-B antibodies and anti-A antibodies are quite common and high in group O donors. This high titer leads to great risk of intravascular hemolytic transfusion reaction if blood group O components, particularly plasma and platelets, are transfused in non-O blood group recipients. It is therefore highly recommended to screen blood components of blood group O for titer of anti-B antibodies and anti-A antibodies. So, group to group transfusion has high success rate but in case of non-availability and emergency, only those groups 'O' components to be transfused to non-group 'O' recipients, which are negative for titre anti-B antibodies and/or anti-A antibodies.

ACKNOWLEDGMENT

We acknowledge the suggestions and help of Dr Muhammad Sajid Yazdani in final drafting the manuscript and addition of charts.

AUTHOR CONTRIBUTION

Anum Sharif: Sample collection.
Mansoor Ishaq Raja: Data analysis.
Waqas Hanif: Manuscript writing.
Muhammad Sajid Yazdani: Statistical analysis.
Hamid Iqbal: Study design and result interpretation.
Noreen Anwar: Manuscript review.

REFERENCES

1. Owen R. Karl Landsteiner and the first human marker locus. Genetics. 2000;155:995–8.
2. Godin MM, Souza LD, Schmidt LC, Vieira LM, Diniz RS, Dusse LM. Dangerous universal donors: the reality of

the Hemocentro in Belo Horizonte, Minas Gerais. Revista brasileira de hematologia e hemoterapia. 2016;38(3):193-98.
3. Lögdberg L, Reid ME, Zelinski T. Human blood group genes 2010: chromosomal locations and cloning strategies revisited. Transfusion medicine reviews. 2011;25(1):36-46.
4. Sood R, Neelima, Kumar D, Kumar T, Kumar V. Antibody titers study in group O blood donors: Tube and column agglutination techniques. J Thrombo Cir. 2016;2:104.
5. Vieira SM, Ferreira RRF, de Matos AJF, Cardoso IM, Graça RMC, Soares ARPB, *et al*. Distribution of feline AB blood types: A review of frequencies and its implications in the Iberian Peninsula. J Feline Med Surg Open Reports. 2017;13:1-4.
6. Park ES, Jo KI, Shin JW, Park R, Choi TY, Bang HI, *et al*. Comparison of total and IgG ABO antibody titers in healthy individuals by using tube and column agglutination techniques. Ann Lab Med. 2014;34:223-9.
7. Victorine GKAP, Liliane SK, Honore AA, Richard YO, Blassonny GDA, Mamadou SY, *et al*. Prevalence of anti-a and anti-b haemolysins in group O blood donors at the national blood transfusion center of Abidjan, Côte d'Ivoire. Int J Immunol. 2016;4:68-72.
8. Shah BV, Rajput P, Virani ZA, Warghade S. Baseline anti-blood group antibody titers and their response to desensitization and kidney transplantation. Indian J Nephrol. 2017;27:195-98.
9. Shah RJ, Harimoorthy V, Shah RB, Barot TK, Kumar KM. Role of extended red cell phenotyping in management of patient with multiple antibodies and their utility in development of indigenous cell panels for antibody screening. Glob J Transfus Med. 2020;5(1):58.
10. Tendulkar AA, Jain PA, Velaye S. Antibody titers in Group O platelet donors. Asian J Transfus Sci. 2017;11(1):22-27.
11. Cooling LL, Downs TA, Butch SH, Davenport RD. Anti-A and anti- B titers in pooled platelets are comparable to apheresis platelets. Transfusion. 2008; 48(10): 2106-13.
12. Beddard R, Ngamsuntikul S, Wafford T, Aranda L. Immunoglobulin M anti-A and anti-B titers in South Texas group O D+ male donors. Transfusion. 2019;59(7):2207-10.
13. Oyedeji OA, Adeyemo TA, Ogbenna AA, Akanmu AS. Prevalence of anti-A and anti-B hemolysis among blood group O donors in Lagos. Niger J Clin Pract. 2015;18:328-32.
14. Kulkarni AG, Ibazebe R, Fleming AF. High frequency of anti-A and anti-B haemolysins in certain ethnic groups of Nigeria. Vox Sang. 1985;48:39-41.
15. Onwukeme KE, Nanna OU. Frequency of anti-A and anti-B haemolysins in Nigerians living in Jos. Niger Med Pract. 1990;20:29.
16. David-West AS. Blood transfusion and blood bank management in a tropical country. Clin Haematol. 1981;10:1013-28.
17. Okafor LA, Enebe S. Anti-A and anti-B haemolysins, dangerous universal blood donors and the risk of ABO antagonism in a Nigerian community. Trop Geogr Med. 1985;37:270-72.
18. Olawumi HO, Olatunji PO. Prevalence and titre of alpha and beta haemolysins in blood group 'O' donors in Ilorin. Afr J Med Sci. 2001;30:319-21.
19. Josephson CD, Mullis NC, Van Demark C, Hillyer CD. Significant numbers of apheresis-derived group O platelet units have "high titer" anti-A/A,B: Implications for transfusion policy. Transfusion. 2004;44(6):805–808.
20. Sorensen CA, Fuglsang E, Jorgensen CS, Laursen RP, Larnkjær A, Molgaard C, *et al*. Probiotics and the immunological response to infant vaccinations; A double-blind randomized controlled trial. Clin Microbiol Infect. 2019;25(4):511.e1-511.e7.